

The first question which ~~this~~ hypothesis brings to mind is, if this membranal development was so crucial to development that it resulted in the selection of membrane-bound cells and the complete extinction of the immediate precursors, how ~~xxxxxx~~ did their ancestors manage to survive without one? One can answer that they also had a membrane, but of a more primitive nature. If so, then what was wrong with it? ~~if~~

Let us assume for a minute that the lipid protein membrane which exists today was arrived at separately by different organisms, and seeing as it was the only or best answer to the ~~then~~ existing functional problems, was developed in different organisms at different times. Then the similarity which we witness today in biomembranes did not evolve from a common source, but rather a common need which led to the same development. On the macroscopic scale, this is known as convergent evolution. While the shark and dolphin come from far-removed branches of the evolutionary tree, their similarity is not coincidental, but rather convergent adaptation to the same environment.

Not similar result

Another pertinent problem is that of membrane biogenesis. Though a cell is capable of synthesizing enzymes from ~~xxx~~ amino acids, and building polymers of sugars starting from one molecule, there is no known example of a case where a cell can create a membrane. While cells do synthesize specific membranal proteins and lipids, which undergo incorporation into the membrane, ~~xxxxxxxx~~ the result is growth of the existing membranes. When cells undergo division, the membranes of sub-cellular organelles, and the cell itself can be seen to close around

do as well. Why is this? It is either because cells never had the ability to synthesize membranes de novo, lost the ability or have it still, but cannot employ it, seeing as they already have membranes, and to lose them would cause death before synthesis could begin.

v ~~xxxxxxx~~

Perhaps cells have lost the ability to synthesize a membrane from scratch. If so, it does not seem logical that all cells, should have lost this characteristics. There must be some organism somewhere which can still do this trick. Perhaps there is, but he has not been found as yet.

Another possibility is that cells can synthesize membranes de novo, but cannot. If we remove the cell membrane

actual

because of their development after the membrane. Their ~~present~~ dependence on membranes dictates their constant presence. As soon as we would remove the membrane of an organelle, the cell would die before it could even begin to synthesize a new membrane.

The best explanation by far is that ~~xxxxxxx~~ organisms have never had the ability to synthesize lipid membranes de novo.

0.1

(100)

0.4

400

If this is the case, where did the membranes come from? One hypothesis is that their original presence was a coincidence. At some stage in development a lipid layer adsorbed to the cell. The cell began to modify the lipid layer and at the same time ~~modify~~ itself to the ensuing ~~physiological changes~~. physiological changes.

This view is subject to many of the arguments previously directed against evolutionary development. Why should lipids have adsorbed to all cells? Could they not, in the course of time, have desorbed, as well? How did the cells develop without them, previously?

Most important, if the ~~ad~~ original adsorption of lipids to the cell was an ~~a~~ accident, why and how did cells develop the ability to synthesize membrane lipids?

It can be argued that

The involvement of membranes in the course of biogenesis is plausible for a number of reasons. Firstly, assuming the hypotheses of Oparin with regards to reducing atmosphere and an organic soup, there is no reason that a lipid layer should not have covered the primeval seas and lagoons. Although lipids and water are not miscible, if mixtures of them are shaken, ~~the~~ microscopic sacs with a lipid bilayer enclosing water are spontaneously formed.

The development of the living organism could have been connected in a morphological sense to biogenesis. ~~What is the relationship between the development of the living organism and biogenesis?~~

The existence of tiny vesicles, composed of fatty acids, long chain alcohols, lipids, and perhaps a few random polypeptides created a separation of the internal solution from the external solution. Different concentrations of solutes and different molecules evolved slowly within the vesicles. The vesicles would grow and divide, forming new sacs, and slowly develop simple catalytic properties. They would grow and divide and form new vesicles with the same properties. Out of this ~~system~~ basic ~~system~~ morphological system, life arose. Such intricate cellular machinery as the genetic apparatus developed at a much later date.

What is the basis of the unvierversality of the cell membrane?

Membranes are essential for life as we know it.

Membranes are not essential for life as we know it, but are incapable of being replaced, as they cannot be spontaneously generated

Similar composition of cell membranes does not necessitate universality of origin.

The best membranes are composed of lipids and proteins.

Convergent evolution.

All membranes started off from the same protomembrane

Life started off from the same protomembrane

Where do cellular components originate?

The third possibility is that certain characteristics of living cells, ~~xxxx~~ structural and biochemical can be dated back to the process of biogenesis itself. This is easiest to see on the molecular level. All cells use the molecule ATP as a major source of chemical energy, even though many ~~xx~~ molecular species are available, and thermodynamically, not inferior. ~~xxxxxx~~ This would indicate that ATP metabolism is at least as old as the first ~~xxxxxxxxxxxx~~ cells which began life as we know it today.

Where do membranes fit into the picture? Are they the result of a biochemical accident, the consequence of converging evolutionary development, or ~~xxxxxxxxxxxxxxxxxxxx~~ organelle which took part in biogenesis?

What is an evolutionary accident?

Evolution proceeds in infinitely small steps, occurring over eons of time. Today it is recognized that the ~~xx~~ molecular basis of evolution is the genetic mutation. Most genetic mutations lead to changes which render the organism inferior, but those few which enhance viability also increase the chances of the mutant to be fruitful and multiply. These, however, are not accidents but statistics.

~~The first thing~~ that we can establish with some certainty is that the membrane had little, if anything, to do with genetic factors

Membranes could be an evolutionary development. At some stage, enzymes were developed which could synthesize lipids and these moved to the outer periphery, forming the first membrane. Alternatively, they could be the result of evolutionary coincidence. At some point in the development of the cell, there was an abundance of lipid molecules in the extraneous solution, which, for thermodynamic reasons, adhered to the extant cell. Only later was this membrane

~~Those~~ Those cells who learned throughout these formative ages to synthesize cell membranes gained an advantage over those which could not, and proliferated ~~xxxxxx~~, while membraneless organisms died out;